UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

2101163070

BIOLOGY **9700/53**

Paper 5 Planning, Analysis and Evaluation **May/June 2010**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a soft pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **both** questions.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

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1	
2	
Total	

This document consists of **7** printed pages and **1** blank page.

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1 Fig. 1.1 shows one type of potometer used by a student to investigate transpiration.

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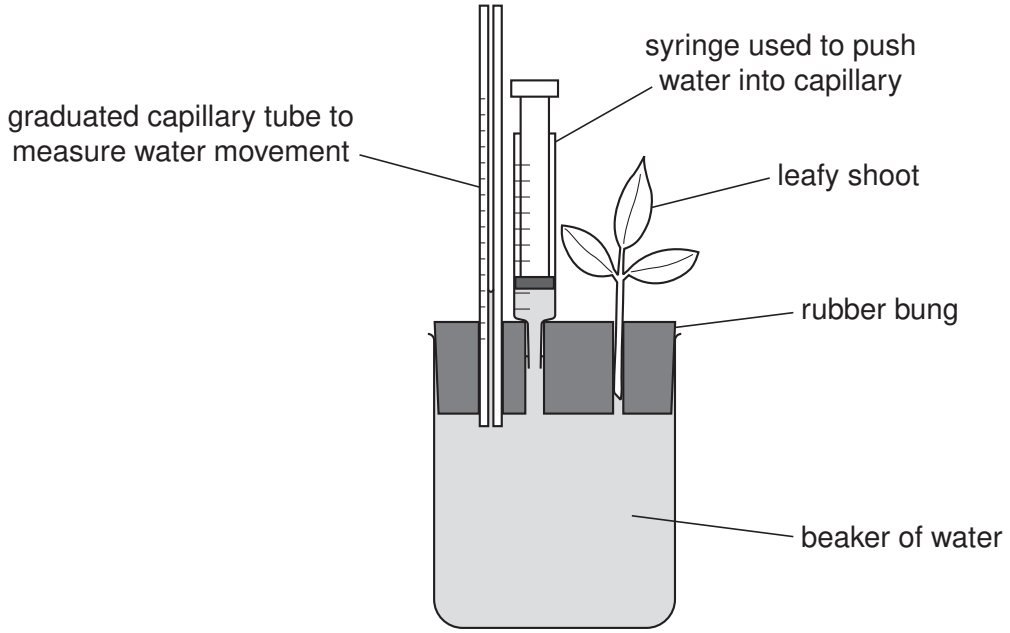

Fig. 1.1

(a) (i) Suggest a hypothesis the student could test about the transpiration of a mesophyte (a plant adapted to a moist environment) and a xerophyte (a plant adapted to a dry environment).

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..... [1]

(ii) Using this potometer, outline a procedure that the student could use to test this hypothesis.

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..... [8]

(iii) The capillary tube measures the distance moved by the water. Explain how the actual volume of water lost can be calculated.

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..... [2]

(b) Sketch a graph to predict the expected results of the investigation.

[2]

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(c) (i) The student then measured the surface area of the leaves by tracing the outline on a grid and counting the number of squares covered by the leaves. This area was doubled.

Mesophyte:
surface area of leaves = 36 cm^2
water loss in 30 minutes = 0.018 cm^3

Calculate the rate of water loss in $cm^3\,m^{-2}\,min^{-1}$.

Show all the steps in your calculation.

[3]

(ii) State a statistical test that the student could use to find out if the difference in water loss between the two types of leaf is significant. State a reason for your choice.

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..... [2]

(d) In a further investigation the student measured the loss in mass of each type of leaf.

Fig. 1.2 shows the experimental set-up.

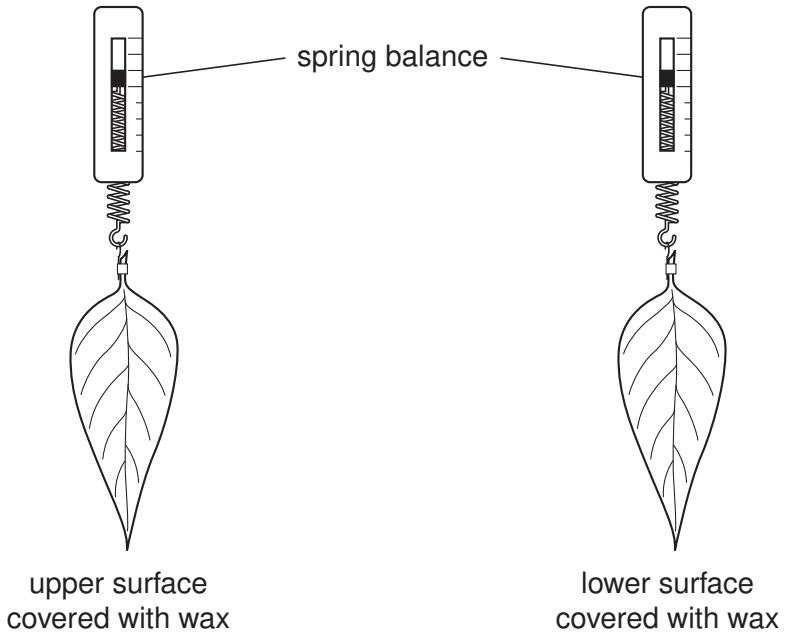

Fig. 1.2

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Table 1.1 shows the results of this investigation.

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Table 1.1

day	loss in mass / g per day			
	upper side covered		lower side covered	
	mesophyte	xerophyte	mesophyte	xerophyte
1	4.25	0.55	1.15	0.05
2	3.20	0.35	1.00	0.05
3	1.55	0.20	0.75	0.00
4	0.50	0.10	0.95	0.05
5	0.05	0.04	1.00	0.00
total loss in mass / g	9.55	1.24	4.85	0.15

State three conclusions that can be drawn from these results.

1. .....

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2. .....

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3. .....

..... [3]

[Total: 21]

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2 The effects of the concentration of two amino acids was tested on the growth of fibroblast cells from mice. The following procedure was used:

- a culture of 2000–3000 cells was added to a growth medium containing all the required nutrients other than the amino acids being tested
- a total of ten cultures were used for each concentration of amino acid
- the cells in the culture were fed every two days with fresh amino acid solution
- after 6 days five cell samples from each of the cultures were counted
- the proportional increase in cell number was calculated for each culture.

Table 2.1 shows the results of this investigation.

Table 2.1

	mean proportional increase in cell number									
	concentration of amino acid added / mmol dm^{-3}									
	0.0	0.1	0.2	0.5	1.0	2.5	5.0	10.0	20.0	40.0
glutamine	0.5	1.0	5.2	7.6	8.7	6.3	1.2	1.3	0.0	0.0
glutamic acid	0.4	0.2	0.1	0.3	0.4	0.4	0.4	0.6	0.8	0.3

(a) State two variables that should be controlled in this investigation. For each, suggest a method by which it might be controlled.

1. .....

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2. .....

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..... [4]

(b) Explain how the proportional increase in cell number is calculated.

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..... [1]

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(c) The hypothesis tested was

Growth of fibroblasts is stimulated by glutamine and inhibited by glutamic acid.

Assess how far the results support the hypothesis.

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[Total: 9]

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